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Title of Project:

Application of ERTS Imagery
to Investigating Land Use and Natural Resources

Contract # NAS5-21886

Progress Report Type I
December 13, 1972-January 13, 1973

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TO INVESTIGATING LAND USE AND NATURAL
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INTRODUCTION

This Status I report covers the period from contract initiation (effective date 13 December 1972) through 13 January 1973. The statement of work provides for an initial preparatory phase followed by a period of appraisal to confirm the validity of the objectives and methods outlined therein. During this initial phase a laboratory has been established, qualified staff have been hired, and supplies and equipment for normal operation have been secured. At the same time, considerable effort has been expended in appraising the objectives and methods specified in the original proposal and the contract statement of work (SOW).

PROBLEM AREAS

Old:

The contract initiation was delayed approximately two months due to illness of the Principal Investigator, Dr. Ernest E. Hardy. Confirmation of this delay has been documented through telephone and letter communications. In addition some delay was incurred in effecting the affirmative action clause with respect to hiring staff. This clause was incorporated in the certification documents and agreed to by Cornell University pursuant to acceptance of government funding. The effects of this delay are rapidly diminishing and should not pose any future problems.

Current:

Current:

Imagery received to date has not included large areas of New York State. This is apparently the result of extensive cloud cover on days of overflight. Failure to receive such data will necessarily restrict our evaluation of imaged seasonal changes (as stated in the SOW) to the sections of New York where representative seasonal data is available. The Hudson River Valley and part of the corridor extending north to the Canadian border as well as a strip of western New York have as yet received no coverage.

ACCOMPLISHMENTS

An area of Tompkins, Cortland, Cayuga, and Onondaga Counties has been selected as a test site. This four-county site was chosen because of available imagery, close proximity for ground truthing, and varied topography and land-use categories. Within an area of approximately 2000 square miles, there are several urban centers (the largest is Syracuse) together with a mixture of agricultural and forest lands. Interpretation of enlarged prints of the 70mm film chips reveal immediate identification of urban sites, airports (including auxillary types,) large railroad yards, major transportation arteries including the New York State Thruway, and the New York State Barge Canal. The near infra-red bands, 6 and 7, are particularly good for mapping watersheds. Band 5 appears to hold the most promise for breaking out types of vegetated areas including cropland, coniferous, and deciduous forest.

Current evaluations in progress include: mapping watersheds and comparing this data to computerized planmaps derived from LUNR (Land Use and Natural Resources Inventory of New York State.) These programs for procuring information from LUNR Planmap IV are developed, tested, and have proven successful as a source of ground truth. A special emphasis will be placed on determining the smallest resolvable terrain anomaly. Due to the high reflective index of water, it appears that bodies of water and wetlands smaller than the theoretical limits of sensor resolution (approximately 240 square feet) are detectable. This, however, has not yet been confirmed by field checks.

Examination of film chips for other parts of New York State has revealed considerable geological data including fault lines in the Adirondacks, and various diagnostic landforms. In addition, in the area of Canada across the Niagara River, legal boundaries called "ridings" and "concession" roads, approximately 7 square miles are apparently evident. In addition, Oneida Lake near Syracuse appears to be oriented differently than projected on current maps. The east end is angled approximately 5° to 6° North of that indicated on maps. More accurate measurements will be taken to account for the apparent discrepancy.

Other accomplishments include setting up a cross-indexed file for the 70mm film chips, and starting a literature review on types of land-use taxonomy and classification. Progress is also underway in designing photographic enhancement techniques to increase interpretability and to determine the effect of scale and image degradation on information from satellite imagery as compared with low altitude imagery and ground truth. Such information is necessary in developing a taxonomic system pertinent to land use inventories. so as to effect a workable design

Planning sessions have also been initiated with three consultants: Dr. Ronald L. Shelton, on computerized land use classification; Dr. Paul Marr, on methods of approach on extracting geographic data from satellite imagery; and Professor E. S. Phillips, on approaches to be initiated on photographic enhancement techniques. These sessions are continuing as needed especially in setting up experiments in photo enhancement and in defining the taxonomy of land use.

CURRENT PROJECTIONS

Data reduction to date is preliminary. Efforts are to be directed toward finalizing data from selected information categories within the preliminary test site for inclusion in the Preliminary Report for February. Special emphasis will be placed on defining the smallest resolvable element for each band per category, breaking out specific land use categories, and cross checking them with the LUNR data, and a preliminary investigation using an I²S densitometer to quantitatively compare the gray levels of different image anomalies representing different land use categories. Little effort will be placed on photo enhancement, image degradation, and scale information during this preliminary phase. It is anticipated that a major part of this work will be started by the second quarter of the contract.

Field checking and the expanding of the study to other parts of New York will commence with spring conditions permitting freer access on secondary roads.

SIGNIFICANT RESULTS

Data reduction is still preliminary at this time, therefore no significant results are to be reported at this time.

RECOMMENDATIONS

1) Film chips should be reproduced and cut to allow somewhat larger margins for handling.

2) Due to the relatively high cost per page of short reports high lighting significant results listed in the NASA ERSP weekly abstract, it would seem appropriate that xeroxed or mimeographed reproductions could be made available to principal investigators on request with a minimal charge to defray expenses of paper, reproduction, and handling. Current procedure would appear to inhibit rapid exchange of data among investigators.

3) There seems to be a considerable amount of unnecessary confusion on the administrative use of code numbers on the part of NASA offices. Most of the numbers required for efficient operation such as reporting requested imagery, and directing correspondence seem superfluous. It is recommended that all correspondence, reports, and such simply reference only the contract number. If this is not suitable, a directive referencing all numbers cited in the Data User Manual and the contract should be clearly defined as to what they represent and when it is required that they be used.